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ABSTRACT

The direction teacher education will take depends upon careful examination of the processes and activities that affect teacher behavior and on meticulous re-definition of the skills, attitudes, and knowledge that contribute to teaching effectiveness. The restrictions of educational bureaucracy and the perpetually changing demands of educational research have led to general criticism of the teacher's role, function, and value in society. Teachers, teacher critics, and educational researchers must persevere in the examination of the research being conducted in teacher effectiveness, and must operate with full knowledge of the intrinsic vagueness and inconsistency involved in attempting to compose formal and universally applicable teaching strategies. (LH)

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THE EMERGING SCIENCE OF TEACHING:

CUTTING THE GORDIAN KNOT

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THE EMERGING SCIENCE OF TEACHING: CUTTING THE GORDIAN KNOT

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ABSTRACT: The training of professional teachers has been a varied enterprise. The innovations and changes have frequently resulted from external demands or needs. The success of educational programs, the evaluation of learning achievement, and the facilitation of adequate teaching competencies have each been questioned. Certain assumptions must be made about the direction that teacher education is to make. We must concentrate upon processes and activities that will influence teacher behavior. We must define those skills, attitudes, and knowledge that will promote teaching effectiveness. Dogmatism or vague generalities should be equally avoided. And as the science of teaching increases, so the impact and influence upon programs should occur. This is the future and promise of teacher education.

Perhaps no profession contains both the seeds of fulfillment and disappointment as education. We have suffered from the dilemma of seeking answers to perpetual problems, to correct social inequalities beyond out reach, and to achieve the promise that each of us desired when we first became teachers. But two contradictory forces play with our idealism. On the one hand, the system, the bureaucracy, the sheer numbers and requirements confine us. On the other hand, we are inundated by change and inconsistency. The consequence is that we are compelled to be either inured by the process, hardened and insensitive, or we are "carried about with every wind of doctrine."

Changes within teacher education have been so dramatic and unpredictable that little consistency can be identified. Significantly within the past few decades, countervailing trends have been evidenced. Certainly science, technology, and international

diplomacy prompted significant changes both in terms of content and instructional processes in the classroom. Emphasis upon hard science, foreign language, and mathematics seemed the appropriate response to be made with the advent of Sputnik. Teachers were prepared to emphasize these. New curricular packages were introduced.

Within another decade, again new priorities were stressed. Silberman (1970) bemoaned that mindlessness exemplified professional education. Without direction or rationality, bureaucratic processes were accused of stifling the learning and growth of children. A flood of popular attacks occurred. Death at an Early Age (Kozol, 1967), Crisis in the Classroom (Silberman, op. cit.), and How Children Fail (Holt, 1964) mirrored the general pessimism that education and teachers were doing a miserable job. The solution was to sensitize and to humanize teachers. Rogers claimed that "teaching, is, for me, a relatively unimportant and vastly overvalued activity," (1969, p. 103). Our task became one of facilitation. And since that seemed remotely defined, the absence of technique and process suffered.

Beginning with models of micro-teaching, laboratory and clinical activities, teacher education changed again. Logically accountability might be directly applied to the science of teaching. Originally described as "competency-based" teacher education, the movement reflected the demands of evidencing that which was done at public expense warranted the confidence and the economics to

support that activity. And much seemed to disqualify the educational efforts that we initiated.

> Educational innovations and especially individualizing instruction do not make for "substantial" gains in reading and mathematics achievement, according to a three-year study by the American Institutes for Research (AIR). The study, prepared for the U.S. Office of Education, explicitly tested the hypothesis that innovation led to measurable gains, but the AIR researchers found "no consistent relationship" between the two. In fact, the level of innovation was found to be negatively related to achievement (ASCD News Exchange, 1977, p.1).

The current situation ought not to instill too much confidence. The "return to the basics" and competency learning for our students are but reflections that the system needs to be reconsidered. Critical observers are citing these dilemmas. Ebel (1976) reported that students have shown a significant decline in test scores, a loss of 41 points in a 12 year period of time. Discipline in many schools has deteriorated to such an extent that the Gallup survey of public attitudes toward public education found it was regarded as the number one educational problem of today's schools (Ibid., p. 307).

The solution appears obvious then. If innovations fail to make a difference and if students are learning less, then teachers need to re-evaluate that which they do and what should be learned.

> What, then, is the job of the schools? If we ask what the public wants its schools to do, the answer is quite plain and fairly simple. The job of the schools is to help pupils to learn. In modern society a large part of what they need to learn is useful verbal knowledge. . . (Ibid., p.308).

Therefore, Ebel continued, clarification of our objectives needs to

occur. "Noncognitive objectives professed by progressive educators" are difficult to measure and tend to be intangible. "An objective whose attainment cannot be measured to any useful degree of precision by any means is worthless as an objective. . . .Truly intangible, unmeasurable educational objectives are no more than verbal dust in the eyes of the intellect" (Ibid., p. 309).

Whereas schools were attacked by Silberman and others as insensitive institutions, today schools are viewed as empty, shallow remnants of incompetency and ineffectiveness. Time reported that ". . . American education in the '70's is in deep trouble. And almost by definition, any problem with public education is a big one" (1977, p.62). With a 152% increase in expenses for education over the past decade, education as a $144 billion enterprise rightly should be examined. The decline of SAT scores, criticism leveled at rising violence, spreading shutdowns, teacher demands, and increased absenteeism are but symptoms of the educational ailment.

> Back-to-basics proponents advocate tightening up the curriculum with more requirements and forcing all students to show "minimal competency" in essential skills before graduating. So far, 26 states have passed laws requiring competency exams; Congress has also begun hearings on whether there should be a nationwide competency exam (Ibid., p. 75).

The entire enterprise of teacher preparation has become the next suspected element. If innovations failed, if students were not learning and if the entire system were impeded by economic and social ineptness, certainly educators and training programs ought to be reconsidered also. Popham observed:

> Results of a recently reported series of investigations reveal that experienced teachers may not be significantly more proficient than "people off the street" with respect to accomplishing intended behavior changes in learners. In three separate replications, groups of experienced teachers were unable to out-perform nonteachers in bringing about specified changes in learners. . . (1971, p. 599).

The peril of the situation has been adequately defined. The task of teacher education institutions, therefore, is one of defining what can be done, what difference it will make, and what must occur. The challenge is one of providing the training tools, the necessary skills, attitudes, and knowledge, to equip a prospective teacher with the capabilities to function in his/her position. The challenge is to provide models of behavior and change for those currently practicing in the profession to ensure that they utilize the skills, attitudes, and knowledge identified as worthwhile in their current assignment. To do otherwise, we flirt with the prospect of a "deschooled" orientation in our society.

> . . . I would guess that unless schools change dramatically in the next few years, the heart of the educational function--helping youngsters develop and learn new concepts, attitudes, and skills--may very well be assumed by other institutions in our society, and the school will be left with the residual function of containment and control. This custodial function--keeping youngsters off the streets, out of the job market, and away from the house so that the parents can work--is generally assumed to be not the primary function of schools but an important subsidiary role...(Frymier, 1973, p.4).

What then must teacher education programs include? What research is available? What might be concluded about the future of teacher education and preparation programs? Certainly its demise

is not confirmed or its failures conclusive. Rather, a variety of information is emerging to identify and conduct worthwhile training programs for teachers.

Teaching is a unique function and activity. Certainly the narrow prescriptions that have been associated with it in the past indicate the inadequacies that we now face in defining teaching in more meaningful terms. For example, the cause-effect relationship between teaching and learning has been a fundamental assumption. One would totally miss the point by contending that teaching should be viewed wholly dependent upon learning outcomes. As a doctor exercises his/her craft with an anticipation of benefiting the patient, simply stated, there is no assurance that the patient will be healed or that the diagnosis will be correct. However, we retain confidence that he/she will perform according to the best known practices and consistent with moral and professional ethics. Teachers should have the same opportunity and latitude.

Smith (1960) stated that educators have assumed a pure correlation between teaching and learning. He decried the notion that no teaching had occurred if the child had not learned. He cited the traditional argument that one has not sold unless one has bought. But the analogy is not a good one. Indeed, many times an excellent seller has done his/her best job and still no one has bought. One, therefore, must conclude that the seller was not at fault. He/she did all that was possible. Perhaps the buyer was

particularly resistant, financially impoverished to buy, or just stubbornly unmotivated.

The same comparison might be made with teachers. If a teacher exercises his/her best known skills, has performed to the best of his/her abilities, and has complied with the most functional behaviors and strategies that are available, and if the child still has not learned, we ought to consider the child as perhaps the source of the problem rather than the teacher. The evaluation of teaching when based only upon student learning and outcome violates rational and intellectual logic and impairs the process of instructional improvement. The teacher's challenge remains to utilize those skills, attitudes, and knowledge that will best serve the capacities, interests, and needs of students. We must admit that a teacher will not be successful with all students and under all circumstances.

> Part of the problem associated with the measurement of teacher effectiveness stems from the fact that we know (or think we know) that certain teachers are more effective than others. As a result, we are inclined to use these effective teachers as a model for judging the effectiveness of all teachers. Yet, down deep, we know that no "universally effective teacher" exists. No teacher is effective with all students and under all conditions, no matter how highly he may be esteemed professionally. For example, "effective teachers" of bright students may be ineffective teachers of the dull and vice versa (Brain, 1965, pp. 35-36).

Pedegogical dogmatism has occurred in some highly competency-oriented programs. This has resulted because of unwarranted confidences or philosophical assumptions that have been made without

justification. Disciples and proponents have preached their dogmas as absolute and irrevocable truth. Such professional myopia negates the possibility that equally productive programs, different in emphases or activity, might exist. Although our knowledge and understanding of effective teaching are increasing, we must resist the temptation of accepting absolute and immutable principles concerning effective teaching.

> . . . We suggest that there are many kinds of "good" teaching, and that the concept "good" when applied to teaching is better stated "good for what?" and "good for whom?" Whether one is creating a curriculum (a plan for a long-term program of education), developing a course or a unit of study (components of a curriculum), developing instructional materials, or deciding what to do in response to a student's behavior, there are many possible courses of action, (Joyce and Weil, 1972, p. 3).

This dilemma must be understood by teacher educators. We are not perpetuating or inculcating a set of prescribed behaviors. Rather, we are considering a variety of options, choices, and alternatives in a professional repertoire that will permit a selection of best possible behaviors, techniques, or practices. Agreed, this will require judgment and commitment. It will necessitate critical but rational assessments. But this is a hallmark of professionalism. Many neophyte teachers haunt the halls of their institutions claiming, "That didn't work for me. But this did."

Medley, Soar, and Soar (1975) identified four elements comprising a paradigm for assessment in educational effectiveness.

These were: (1) teacher training; (2) teacher behavior or performance; (3) pupil behavior; and (4) pupil outcomes. They concluded that "the better procedure for evaluating teachers would be the measurement of teacher behavior, which is under his control to a greater degree, although even this measurement is neither simple nor easy. . ." (1975, p. 31). Teacher education institutions need to concentrate upon those teacher behaviors that make a difference or according to the best professional judgment are more adequate than something else. By concentrating upon teacher competencies, abilities, and processes, we promote that element of the educational activity with which we can directly influence and change.

Institutional flexibility and latitude should be permitted so that individual programs with unique characteristics might be developed. However, these programs, regardless of their diversity, ought to concentrate upon the "processes" that go into that training and preparation program. We have concentrated upon the characteristics of programs: i.e., prescribed hours of psychology, methodology, and evaluation. But this does not define what the teacher can do with these. A great deal may be known by many but practiced by very few. This has been a major criticism of teacher education. We have known about the elements of learning and teaching, but we have had neither the models, the opportunities to emulate, nor the inclusion of these practices so that mastery of the processes of teaching might be displayed.

> Probably the most significant weakness of teacher effectiveness research has been its failure to observe teachers in the process of teaching. Instead of seeking the causes of pupil growth in the interactions of teachers and pupils, investigators have been content to study the effects of variables such as curricular innovations, teacher background experiences, or programs of teacher education. Variables like these can only affect pupils if they result in substantial changes in the classroom activities of teachers and pupils. . . (Good, et.al., 1975, p. 13).

As educators, we have lauded the value of "experiential" learning, learn-by-doing, and activity-centered curricula. Then, paradoxically, we have traditionally violated these premises ourselves, assuming that through some peripheral osmosis that teacher candidates will make the transition from description to practice. Our challenge is to provide a program, intensive in experiences and activities, where students may practice what is preached, identify processes appropriate for his/her style and capabilities, and demonstrate those skills. This is process education.

An additional dimension has to do with the ethical responsibility involved with teaching. The establishment of a rationale or a set of justifications for one's behavior must be included in a training program. Without adequate foundations or principles, the beginning teacher will make decisions either out of desperation or out of emulation: desperation if no viable alternative is known; or emulation if a model can be identified. It would be a better enterprise if we knew a variety of vantage points from whence to view the teaching activity.

> When we observe (teaching)--visually and/or auditorily--we do so from a particular vantage point. We have no choice. We all know that observation is selective and the first step is the selection of our framework, whether we are aware of it or not, whether we admit it or not. Frameworks are "windows through which we see the world and our own transactions with the world, and they make the world meaningful in their own terms". . .(Hyman, 1968, p. 313).

Hyman (1974) has identified some of these windows from whence we might make judgments and validate our perspectives. These include: (1) communication; (2) social climate; (3) the cognitive processes; (4) learning and cognitive development; (5) the psychological climate; (6) games; (7) aesthetics; (8) nonverbal communication; and (9) strategies. As we initiate teacher education training we must also identify the window, the framework, the position from whence teaching is to be viewed. We all recall the anxiety produced when we performed from one particular perspective, only to be criticized and critiqued by another.

What then should be identified as categories of teaching processes? The literature includes a variety of interpretations. Some individuals include generalities and abstractions beyond the possibility of being implemented. "Knowledge of one's field," "a liking for children," "understanding learning theory," "and dedication to the profession" are laudable goals. The question remains one of implementation more than desirability.

Others advocate specifying teacher behaviors in such a minutia that the total personal dimension of teaching is lost. These indiuals have divided and dissected teaching so precisely and infinitely

that no element remains unexamined. These butchers of the science of teaching believe that anything and everything can be cut into the smallest element. This fetish when carried to the extreme eliminates the individuality and style that each new teacher might bring to the profession.

We must constantly persevere in the examination of the research being conducted in teacher effectiveness. We must humbly concede that our science is imprecise. Though delicate and insecure, we are beginning to identify some principles and conclusions that will aid us in defining teacher education. In this endeavor, we admit that our best information remains incomplete, inconclusive, and judgmental. "Perhaps the beginning of wisdom in the study and improvement of teaching behavior is the confession or our lack of knowledge that can be applied with confidence to a teacher education program" (Rosenshine and Furst, 1971, p. 40). For example, Rosenshine and Furst have identified some of these categories of effective teaching behavior. The first five are the strongest with the remaining six being less conclusive. These elements include: (1) clarity; (2) variability; (3) enthusiasm; (4) task-oriented and/or businesslike behaviors; (5) student opportunity to learn criterion material; (6) use of student ideas and general indirectness; (7) criticism; (8) use of structuring comments; (9) types of questions; (10) probing; and (11) level of difficulty of instruction.

The designer of a teacher training model might consider how and where these elements might be included. Is the candidate capable of organizing and presenting his/her ideas with clarity? Does the candidate display alternatives or variety in using methods or activities to stimulate learning? Does the student have an excitement about the activity, the subject, and the value of that being taught? By asking these needful questions, one begins to see the dimensions that need to be reconsidered.

Vincent (1969), Hamachek (1969), Mood (1970), Gage (1972), Zahorik (1973), Summers and Wolfe (1975) and others have examined positive teaching behaviors and activities.

These range from verbal skills, openness, indirectness, flexibility, willingness to experiment, etc. A fundamental premise of a teacher education program should be the assumption that we are witnessing a significant activity resulting in change. As our knowledge becomes more definite, so our ability to incorporate that knowledge into practice will occur. This is the positive feeling that we are indeed contributing to a progressive and improving profession. It is interesting that research ("Teachers Do Make A Difference," 1976) has confirmed that it is not a single teaching skill that makes the difference, rather it is the "combinations" that result in improvement. Our tasks, as educators and teachers, include the identification, implementation, and evaluation of those components that in combination produce the unique situation where learning occurs.

> There is a common belief that the home and community environment has such a powerful influence on the ability of children to learn that teachers make a very small difference, if any. One of the most important results of this study is the evidence that teachers do make a significant contribution to pupils' learning. . . (Ibid., p.8).

This optimism--perhaps confidence is more appropriate--that teachers make a difference, and indeed, the programs that produce those teachers also make a difference. The emerging science of teaching has initiated new dimensions of teacher preparation. We are literally implementing and interpreting theory into practice. Evidence has been generated to confirm this affirmation. This exciting prospect, this challenge for a new dimension of teacher education should prove to be a source of renewal and improvement. And thus, Goethe's words should appeal to us all:

> Yes, to this thought I hold unswerving,
> To wisdom's final fruit, profoundly true:
> Of freedom and of life he only is deserving
> Who every day must conquer them anew.

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